Paraguay Mathematical Olympiad 2015

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by Mualpha7

1 Alexa wrote the first 16 numbers of a sequence:

$$1, 2, 2, 3, 4, 4, 5, 6, 6, 7, 8, 8, 9, 10, 10, 11, \ldots$$

Then she continued following the same pattern, until she had 2015 numbers in total.
What was the last number she wrote?

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2 Consider all sums that add up to 2015. In each sum, the addends are consecutive positive integers, and all sums have less than 10 addends. How many such sums are there?

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3 A cube is divided into 8 smaller cubes of the same size, as shown in the figure. Then, each of these small cubes is divided again into 8 smaller cubes of the same size. This process is done 4 more times to each resulting cube. What is the ratio between the sum of the total areas of all the small cubes resulting from the last division and the total area of the initial cube?

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4 The sidelengths of a triangle are natural numbers multiples of 7, smaller than 40. How many triangles satisfy these conditions?

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5 In the figure, the rectangle is formed by 4 smaller equal rectangles.
If we count the total number of rectangles in the figure we find 10.
How many rectangles in total will there be in a rectangle that is formed by n smaller equal rectangles?
